Handouts for Participants:

Vitamin D Deficiency:
How it Relates to Patients with Developmental Disabilities and Ways to Correct it

“Vitamin D Symposium”

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- The UV Foundation (McLean, VA),
- The Vitamin D Council (San Luis Obispo, CA),
- The Vitamin D Society (Canada).

Vitamin D and reduction and/or treatment of:
- Physical functioning
- Dental caries
- Respiratory infections
- Diabetes mellitus
- Cardiovascular disease
- Cancer
- Neuroprotection
- Autism
- Mortality rates
- Randomized controlled trials
- Recommendations
- Sources for additional information

Numerous studies, particularly in the German literature in the 1950s, show vitamin D–producing ultraviolet light improves athletic performance. Furthermore, a consistent literature indicates physical and athletic performance is seasonal; it peaks when 25-hydroxyvitamin D [25(OH)D] levels peak, declines as they decline, and reaches its nadir when 25(OH)D levels are at their lowest. Vitamin D also increases the size and number of Type II (fast twitch) muscle fibers. Most cross-sectional studies show that 25(OH)D levels are directly associated with musculoskeletal performance in older individuals. Most randomized controlled trials, again mostly in older individuals, show that vitamin D improves physical performance.


Dental caries are caused by oral bacteria.

Vitamin D, through induction of cathelicidin, reduces concentration of oral bacteria.

This was first shown in a study of vitamin D2 supplementation in 1928 by May Mellanby.

Several recent studies identified cathelicidin as a way to reduce dental caries.

Vitamin D has been used to prevent and treat dental caries. The objective of this study was to conduct a systematic review of controlled clinical trials (CCTs) assessing the impact of vitamin D on dental caries prevention. Twenty-four CCTs encompassing 2,827 children met the inclusion criteria.

The pooled relative-rate estimate of supplemental vitamin D was 0.53 (95% CI, 0.43–0.65).


Vitamin D induces production of cathelicidin, which has antimicrobial properties.

Higher 25(OH)D levels have been found associated with reduced risk of acute respiratory infections, and pneumonia.

A randomized controlled trial on schoolchildren in Japan using 1100 IU/d vitamin D3 found a 67% reduction for influenza type A for those not using any other vitamin D supplements compared to 200 IU/d. [Urishama, 2010]

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Respiratory Infections

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- Effects on cellular differentiation and proliferation
- Maintains epithelial cell integrity and tight junctions between cells
- Increased calcium absorption
- Anti-angiogenesis
- Anti-metastasis

The beneficial effects of vitamin D on cancer appear to be stronger for progression and metastasis than for incidence.

Ecological Studies of UVB, Vitamin D, Cancer

- The first epidemiological study hypothesizing that solar UVB, through production of vitamin D, reduced the risk of cancer was an ecological study published in 1980.
- The brothers Cedric Garland and Frank Garland, beginning graduate students at Johns Hopkins School of Public Health in 1974, looked at the map of colon cancer mortality rates in the U.S. and saw a link to solar radiation.


Occupational Study of Cancer Incidence in Nordic Countries

Based on five case-control studies from Germany, Mexico, UK, and USA


Meta-Analysis of Breast Cancer Risk with Respect to Diagnostic Serum 25(OH)D
Gastrointestinal: colon, esophageal, gallbladder, gastric, pancreatic, rectal
Urinary: bladder, kidney
Male: prostate (but U-shaped?)
Female: breast, (endometrial), (ovarian), vulvar

“The conflation of in vitro, ex vivo, and animal model data provide compelling evidence that vitamin D has a crucial role in proliferation, differentiation, neurotrophism, neuroprotection, neurotransmission, and neuroplasticity. Vitamin D exerts its biological function not only by influencing cellular processes directly, but also by influencing gene expression through vitamin D response elements.”


The UVB–vitamin D–autism hypothesis was proposed by John J. Cannell, M.D., in 2008:
Since then, a number of studies have provided additional support for this hypothesis.

It appears that both low 25(OH)D levels during pregnancy and in early life may be risk factors for the development of autism.
It also appears that raising 25(OH)D levels can reduce the symptoms of autism.
Parents of autistic children who have access to swimming pools have reported summertime improvement in symptoms to me. A Japanese case report found the same summer time improvements. Vitamin D is highly seasonal with a summertime surfeit and a wintertime deficit. Recent research indicates that autism often first present itself during the second and third year of life. This is a time when most toddlers have no known sources of vitamin D.

Vitamin D has remarkable antioxidant, anti-inflammatory, and anti-autoimmune properties. In vitro, in vivo, and animal experiments provide compelling data for vitamin D's role brain proliferation, differentiation, neurotrophism, neuroprotection, neurotransmission, and neuroplasticity. It also upregulates glutathione, upregulates a suite of genes involved in DNA repair and raises the seizure threshold. Adequate, perhaps pharmacological, doses of vitamin D may have a treatment effect in the core symptoms of autism.

Given that UVB and vitamin D have many health benefits, it is reasonable to think that those with higher 25(OH)D levels would have lower mortality rates. This expectation was reconfirmed in a paper published last week:


RCTs are essential for pharmaceutical drugs to show both efficacy and lack of harm. Most vitamin D RCTs to date have been based on the pharmaceutical drug model (one source of agent, linear dose–response relation). These assumptions are not valid for vitamin D.

Thus, the fact that many of the results from ecological, laboratory, and observational studies have not been confirmed from vitamin D RCTs conducted on populations with 25(OH)D levels above 20–25 ng/mL given 400–1000 IU/d vitamin D should not be considered evidence that vitamin D is not effective in reducing risk of disease.

 start with the 25(OH)D level–health outcome relation from observational studies. Measure 25(OH)D levels and only include those with low levels (<15–20 ng/mL). Supplement with sufficient vitamin D3 to raise 25(OH)D levels to >40 ng/mL. Also make sure that cofactors are optimized. Remeasure 25(OH)D levels.


There is strong evidence that having 25(OH)D levels above 30 ng/mL up to 50 ng/mL is associated with many health benefits for those with developmental disabilities. To reach those levels takes 1000–5000 IU/d vitamin D3 in the absence of frequent solar ultraviolet–B irradiance.